Remarks and Arguments

Claims 1-42 were presented for examination. Claims 1-5, 10-11, 15-18, 24-27, 33-36 and 42 have been amended. New claims 43-47 have been added.

Claims 1-32, 35 and 42 have been rejected under 35 U.S.C. §112, second paragraph, for lack of antecedent bases and for indefiniteness. Specifically, claims 1, 10, 15, 24 and 42 were rejected for lack of an antecedent basis for the term "the associated task queue." In response, this term has been deleted from claims 1, 10, 15, 24 and 42 to eliminate the antecedent basis problem.

Claims 1, 10, 15, 24, 33 and 42 were rejected as indefinite because the examiner considered the relationship between the recited "associated task queue", the "task-queue set" and the recited "LIFO access mode" and "FIFO access mode" was unclear. In response, the terms "associated task queue" and task-queue set" have been deleted from the claims. In addition, claims 1, 10, 15, 24, 33 and 42 have been amended to clarify the relationship between the access modes and the recited popping and pushing. Claim 1 is illustrative.

Amended claim 1 now recites a computer system which is configured to "provide at <u>least one task queue having a top end and a bottom end...</u>" and, for each provided task queue, employ a separate execution thread associated therewith to "<u>select repeatedly a current access mode from one of a LIFO access mode and a FIFO access mode</u> in accordance with a mode-selection criterion and to perform dynamically identified tasks <u>by repeatedly popping a task identifier from one of the top end and the bottom end of that task queue in order to access that task queue in a LIFO access mode or a FIFO access mode in accordance with the current access mode</u>...(underlining added to emphasize changes)" Thus, claim recites that a task identifier is popped off a task queue at either the top end or the bottom end of the queue depending on whether a LIFO access mode or a FIFO access mode is specified by the current access mode.

It is believed that these changes clearly describe the relationship between the recited popping of the task identifier and the recited LIFO and FIFO access modes. Accordingly, it is believed that the rejection under 35 U.S.C. §112, second paragraph has been overcome with respect to amended claim 1. Similar amendments have been

made to claims 10, 15, 24, 33 and 42 and these amended claims are also believed to be clear and definite.

Amendments have been made to claims 2, 16, 25 and 34 to conform these claims to the changes made in their respective parent claims.

Claims 3, 17, 26 and 35 have been rejected under 35 U.S.C. §112, second paragraph because the examiner considered that it was unclear whether the term "the queue" referred to the "task-queue" recited the respective parent claims. In response, claims 3, 17, 26 and 35 have been amended to delete the term "the queue." Claim 3 is representative. It now recites "A computer system as defined in claim 1 wherein queue accesses in each provided task queue are circular." It is believed that amended claim 3 now clearly and distinctly points out an aspect of the invention as required by 35 U.S.C. §112, second paragraph. Similar amendments have been made in claims 17, 26 and 35.

Claims 1-4, 8, 15-18, 22, 24-27, 31, 33-36, 40 and 42 have been rejected as obvious in view of U.S. Patent No. 5,410,722 (Cornaby.) The examiner asserts that the Cornaby reference discloses all of the recited elements except that it does not explicitly disclose repeatedly performing dynamically selected tasks. However, the examiner claims that the Cornaby reference does sequentially process tasks and thus, it would have been obvious for the Cornaby system to repeatedly perform selected tasks.

The present invention is directed to reducing the length of a task queue in certain circumstances in which the queue length depends on the manner of processing the queue. For example, in some circumstances the queue may grow in length faster if the queue is processed in a FIFO manner rather than a LIFO manner. In accordance with the principles of the present invention, the processing of each task queue can be dynamically switched between FIFO mode and LIFO mode in order to hold the queue length to a minimum. In one embodiment, the system monitors some criterion, such as the rate of queue growth, and changes the processing mode of that single queue in order to minimize the rate of queue growth.

The Cornaby reference discloses a queue system in which there are multiple task queues that are processed in either a FIFO or a LIFO manner. The processing manner is chosen by the system designer at the time that the system is designed. See,

for example, Cornaby, column 2, lines 50-57 and column 5, lines 3-7. In order to change the manner in which a task is processed, a register for the task is moved from one queue to another as described in Cornaby, column 4, lines 6-19. The Cornaby reference does not disclose or suggest changing the processing mode of a single queue on the basis of a mode criteria.

The claims clearly recite this difference. For example, claim 1 recites that a separate execution thread is employed for each provided task queue to repeatedly select a current access mode from either a LIFO or a FIFO mode and to repeatedly pop a task identifier from either the top end or the bottom end of that task queue in order to access that task queue in either a LIFO manner or a FIFO manner during task processing. See claim 1, lines 5-15. As previously mentioned, Cornaby does not disclose or suggest that type of operation. Instead, in Cornaby, queue access modes are determined before task processing starts. Consequently, claim 1 distinguishes over the cited reference. Independent claims 10, 15, 24, 33, and 42 contain similar wording and distinguish over the cited reference in same manner as claim 1.

Claims 2-4 and 8 are dependent, either directly or indirectly on claim 1 and incorporate the limitations thereof. Therefore, they distinguish over the cited Cornaby reference in the same manner as claim 1. In addition, these claims recite further elements not shown or disclosed by Cornaby. For example, claim 8 recites that the execution thread for a task queue that contains no entries can perform tasks from another task queue. While Cornaby does disclose an empty queue as noted by the examiner, Cornaby does not disclose or suggest that the queue handler for that queue could or should process other tasks if the empty queue contains no task registers as recited in claim 8. Thus, claim 8 patentably distinguishes over the cited Cornaby reference.

Claims 16-18 and 22 are dependent, either directly or indirectly on claim 15 and incorporate the limitations thereof. Therefore, they distinguish over the cited Cornaby reference in the same manner as claim 15. Further, the limitations in claims 16-18 and 22 parallel those in claims 2-4 and 8 and, consequently, the former claims distinguish over the cited reference in the same manner as the latter claims.

Claims 25-27 and 31 are dependent, either directly or indirectly on claim 24 and incorporate the limitations thereof. Therefore, they distinguish over the cited Cornaby reference in the same manner as claim 24. Further, the limitations in claims 25-27 and 31 parallel those in claims 2-4 and 8 and, consequently, the former claims distinguish over the cited reference in the same manner as the latter claims.

Claims 34-36 and 40 are dependent, either directly or indirectly on claim 33 and incorporate the limitations thereof. Therefore, they distinguish over the cited Cornaby reference in the same manner as claim 33. Further, the limitations in claims 34-36 and 40 parallel those in claims 2-4 and 8 and, consequently, the former claims distinguish over the cited reference in the same manner as the latter claims.

Claims 5-7, 9, 10-14, 19, 20-21, 23, 28-30, 32, 37-39 and 41 have been rejected under 35 U.S.C. §103(a) over Cornaby in view of applicant admitted prior art (AAPA). The examiner comments that Cornaby discloses the invention as claimed by does not explicitly teach that the tasks performed implement a garbage collection system. However, the examiner indicates the AAPA discloses that garbage collectors are well-known and that it would have been obvious to combine Cornaby and the AAPA garbage collectors in order to provide automatic reclamation of dynamically allocated memory.

Claims 5-7 and 9 are dependent, either directly or indirectly on claim 1 and incorporate the limitations thereof. Therefore, they distinguish over the cited Cornaby reference in the same manner as claim 1. In addition, it is noted Cornaby does not mention or discuss the problem solved by the present invention – limiting task queue size. Thus, there is no motivation for using Cornaby with garbage collection systems. Further, even if the Cornaby system was applied to garbage collectors in order to limit queue size, in the Cornaby system this would be accomplished by shifting task between queues, not by changing the processing mode of each queue as claimed. Consequently, claims 5-7 and 9 patentably distinguish over the Cornaby reference.

Claim 10 contains limitations that parallel those in claim 1 and accordingly it distinguishes over the cited reference in the same manner as claim 1. Claims 11-14 are dependent, either directly or indirectly on claim 10 and incorporate the limitations thereof. Therefore, they distinguish over the cited Cornaby reference in the same manner as claim 10. In addition, claim 12 contains limitations that parallel those in

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claim 8 and therefore distinguishes over the cited reference in the same manner as claim 8 discussed above.

Claim 19, 20-21 and 23 are dependent, either directly or indirectly on claim 15 and incorporate the limitations thereof. Therefore, they distinguish over the cited Cornaby reference in the same manner as claim 15.
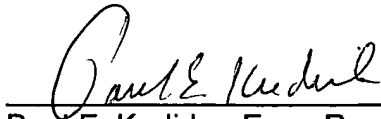
Claims 28-30 and 32 are dependent, either directly or indirectly on claim 24 and incorporate the limitations thereof. Therefore, they distinguish over the cited Cornaby reference in the same manner as claim 24.

Claims 37-39 and 41 are dependent, either directly or indirectly on claim 33 and incorporate the limitations thereof. Therefore, they distinguish over the cited Cornaby reference in the same manner as claim 33.

New claims 43-47 have been added to specify that the mode-selection criterion is based on the number of entries in the task queue. These claims are based on the present disclosure at page 21, lines 23 *et seq*. As discussed above, the Cornaby reference does not disclose or suggest that the access mode of each queue be determined by the number of entries in that queue.

In light of the forgoing amendments and remarks, this application is now believed in condition for allowance and a notice of allowance is earnestly solicited. If the examiner has any further questions regarding this amendment, he is invited to call applicants' attorney at the number listed below. The examiner is hereby authorized to charge any fees or direct any payment under 37 C.F.R. §§1.17, 1.16 to Deposit Account number 02-3038.

Respectfully submitted

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